

**FINAL
SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT
FOR IRON MOUNTAIN ROAD RANGES
AT FORT McCLELLAN
CALHOUN COUNTY, ALABAMA**

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List of Acronyms

| | |
|----------------------|---|
| µg/egg | micrograms per egg |
| µg/L | micrograms per liter |
| AET | adverse effect threshold |
| ALAD | aminolevulinic acid dehydratase |
| ASTDR | Agency for Toxic Substances and Disease Registry |
| BERA | baseline ecological risk assessment |
| BTAG | Biological Technical Advisory Group |
| BTV | background threshold value |
| COPEC | chemicals of potential ecological concern |
| DDD | dichlorodiphenyldichloethane |
| DDE | dichlorodiphenyldichloethene |
| DDT | dichlorodiphenyltrichloroethane |
| DMBA | 7,12-dimethylbenz(a)anthracene |
| EC ₂₀ | Effects concentration where 20 percent of the tested population exhibit a particular endpoint or effect |
| EDQL | ecological data quality levels |
| EE/CA | engineering evaluation/cost analysis |
| EPA | U.S. Environmental Protection Agency |
| ER-L | effects range-low |
| ER-M | effects range-medium |
| ESV | ecological screening value |
| FTMC | Fort McClellan |
| HEAST | Health Effects Assessment Summary Tables |
| HQ | hazard quotient |
| HQ _{screen} | screening-level hazard quotient(s) |
| ICRP | International Commission on Radiological Protection |
| IMR | Iron Mountain Road |
| IRIS | Integrated Risk Information Service |
| IT | IT Corporation |
| LD ₅₀ | lethal dose for 50 percent population tested |
| LOAEL | lowest observed adverse effect level |
| mg/kg | milligrams per kilogram |
| mg/kg/day | milligrams per kilogram per day |
| MDCC | maximum detected constituent concentration |

List of Acronyms (Continued)

| | |
|-------------------|--|
| mg/L | milligrams per liter |
| mg/m ³ | milligrams per cubic meter |
| mg/kg-bw/day | milligram per kilogram of body weight per day |
| NAS | National Academy of Sciences |
| Ni | nickel |
| NLM | National Library of Medicine |
| NOAA | National Oceanic and Atmosphere Administration |
| NOAEL | no observed adverse effect level |
| NRC | National Research Council |
| NRCC | National Research Council of Canada |
| OSWER | Office of Solid Waste and Emergency Response |
| PAH | polycyclic aromatic hydrocarbon |
| ppb | parts per billion |
| ppm | parts per million |
| SAIC | Science Applications International Corporation |
| SCM | site conceptual model |
| SLERA | screening level ecological risk assessment |
| SQRT | Screening Quick Reference Table |
| SVOC | semi-volatile organic compound |
| USAEHA | U.S. Army Environmental Hygiene Agency |
| USFWS | U.S. Fish and Wildlife Service |
| V | vanadium |
| VOC | volatile organic compound |
| XRF | x-ray fluorescence |

1.0 Introduction

In order to determine the potential ecological risks posed by site-related chemicals at Ranges 12, 13, and 19 and the Skeet Range at Fort McClellan (FTMC) in Calhoun County, Alabama, a screening-level ecological risk assessment (SLERA) was conducted. The SLERA was originally a part of the *Engineering Evaluation and Cost Analysis (EE/CA) for the Small Arms Ranges at Iron Mountain Road* (IT Corporation [IT], 2001a). As such, many of the details regarding site history, range operation, data collection and analysis, and other background information are presented in the EE/CA (IT, 2001a). This revised SLERA is another iteration of the previous draft and incorporates additional data collected during field efforts at the Iron Mountain Road (IMR) ranges subsequent to the submission of the original SLERA. This SLERA consists of a description of the habitat(s) in and around the ranges, a discussion of the constituents detected in samples collected from environmental media at the various ranges, a discussion of the conceptual site model, an estimation of the screening-level risk, the identification of the constituents of potential ecological concern (COPEC), an uncertainty analysis, a discussion of the different lines of evidence, and a summary of the results and conclusions.

2.0 Environmental Setting

The terrestrial habitat occurring at the Iron Mountain Road ranges falls into two general categories: “cleared” areas and forested areas. The “cleared” areas are those areas that were formerly maintained as lawns or mowed fields. Since maintenance activities have ceased in these areas, pioneer species are now colonizing these ranges. Typically, the species most likely to colonize these areas are the “weed” species that tend to be vigorous pioneer plants that grow and spread rapidly. The first of the pioneer species to invade these abandoned areas are the grasses and herbaceous species. These formerly maintained grassy areas are classified as being in an early old field successional state. Over time, these grass and herbaceous species will be followed by shrubs and small trees. The early old field successional areas at the Iron Mountain Road ranges are dominated by various grasses and herbs, including *Rumex spp.* (dock), *Trifolium spp.* (clover), *Astragalus spp.* (vetch), *Asclepias spp.* (milkweed), *Galium spp.* (bed straw), *Chrysanthemum leucanthemum* (ox-eye daisy), and *Sorghum halepense* (Johnson grass). Other old field herbaceous species occurring at the Iron Mountain Road ranges are *Rubus occidentalis* (black raspberry), *Toxicodendron radicans* (poison ivy), *Rubus glabra* (smooth sumac), *Smilax rotundiflora* (green brier), *Lonicera japonica* (Japanese honeysuckle), *Vitis labrusca* (fox grape), and *Rosa multiflora* (multiflora rose).

The forested areas outside of the “cleared” areas are best characterized as mixed deciduous/coniferous forest. The cover species typically found in the forested areas surrounding the Iron Mountain Road ranges include *Pinus virginiana* (scrub pine), *Pinus taeda* (loblolly pine), *Quercus alba* (white oak), *Quercus stellata* (post oak), *Quercus prinus* (chestnut oak), *Quercus falcata* (southern red oak), *Prunus serotina* (wild black cherry), *Celtis occidentalis* (hackberry), *Juglans nigra* (black walnut), and *Cornus stolonifera* (flowering dogwood). These mixed deciduous/coniferous forests exhibit sparse, shade-tolerant undergrowth species such as *Parthenocissus quinquefolia* (Virginia creeper), *Polystichum acrotichoides* (Christmas fern), and *Toxicodendron radicans* (poison ivy). Descriptions of the habitats at each of the small arms ranges at Iron Mountain Road are presented in the following sections.

2.1 Skeet Range Habitat

The Skeet Range comprises two main habitat types: “cleared” areas and forested areas. The “cleared” area encompasses approximately 2 acres at and adjacent to the firing lines. The habitat within this area is dominated by grasses and early old field successional species. In the past, this area was maintained lawn with concrete walkways throughout. Since maintenance activities have ceased, the grasses have grown uncontrolled, and early successional species have intruded.

Various grasses and herbaceous species dominate this habitat type. Scrub pine (*Pinus virginiana*) saplings have also begun to encroach on this cleared area. The forested areas surrounding the “cleared” area at the Skeet Range can be characterized as mixed deciduous/coniferous forest. Scrub pine and southern red oak dominate this habitat. There are minimal understory or herbaceous layers in this forest type, as fallen leaves and pine needles form a thick mat that precludes the germination of smaller plants. White-tailed deer, wild turkey, gray squirrel, and various song birds were observed on-site. Details regarding site history, physical characteristics, and other background information are presented in the EE/CA (IT, 2001a). A general depiction of the Skeet Range is presented in Figure 3-1.

Remount Creek, which runs along the western boundary of the Skeet Range, and its tributaries, that generally run east-to-west across the Skeet Range, exhibit mostly gravel and cobble substrate with very little organic matter. Remount Creek is narrow (less than 3 feet across) and shallow (less than 6 inches deep) when there is water present. Remount Creek and its tributaries are all dry during significant portions of the year and were dry during the on-site habitat evaluation conducted May 30 and 31, 2000. The presence of water in Remount Creek is highly dependent upon the volume of precipitation received by the Remount Creek watershed. During dry periods, the creek may be entirely dry for significant portions of the year (6 to 8 months). Under normal rainfall conditions, the creek most likely maintains flow for 6 to 8 months of the year. The ephemeral nature of Remount Creek and its tributaries in this area limits their ability to support many aquatic organisms (e.g., large fish) and other organisms that rely on aquatic species for food (e.g., piscivores).

Remount Creek in the vicinity of the Skeet Range has been identified as a moderate quality foraging area for the federally listed endangered gray bat (*Myotis grisescens*) (Garland, 1996). This section of Remount Creek has been identified as a gray bat foraging area because it allegedly provides habitat for aquatic insects, which are fed upon by the gray bat. However, Remount Creek is dry during significant portions of the year, which precludes the presence of aquatic insects during those dry periods. Additionally, construction of the “Eastern Bypass” directly adjacent to the Remount Creek corridor has eliminated a significant portion of the tree and shrub canopy that formerly covered Remount Creek. Because the gray bat requires continuous cover while traveling to and from its foraging habitats and while foraging, the elimination of significant portions of the forest in this area would negatively affect its foraging habits. Based on its ephemeral nature in this area and the elimination of significant portions of the forest canopy, Remount Creek may no longer provide moderate quality foraging habitat for the gray bat in the vicinity of the Skeet Range.

2.2 Range 19 Habitat

The total site, including the extensive range fan, encompasses 1,529 acres. The main study area is limited to approximately 5 to 7 acres. Details regarding site history, physical characteristics, and other background information are presented in the EE/CA (IT, 2001a). The study area of Range 19 consists almost entirely of maintained lawn, mowed fields, unvegetated soil, and roadways. Since maintenance activities have ceased, the grasses have grown uncontrolled and early successional species have intruded. Various grasses and herbaceous species dominate this habitat type. Scrub pine saplings (*Pinus virginiana*) have also begun to encroach into these previously maintained areas. The embankment on the eastern side of the site is almost completely void of vegetation, due to the fact that soil was historically scraped and graded along this embankment for maintenance purposes when the ranges were active. The area surrounding the cleared areas of Range 19 can be characterized as mixed deciduous/coniferous forest. Scrub pine and southern red oak dominate this habitat. There are minimal understory or herbaceous layers in this forest type, as fallen leaves and pine needles form a thick mat that precludes the germination of smaller plants. White-tailed deer, wild turkey, gray squirrel, and various song birds were observed on site. A general depiction of Range 19 is presented in Figure 3-4.

Remount Creek is dry for significant periods of time over the vast majority of the distance that it passes along the western boundary of Range 19 (approximately 1,000 feet). The only portion of Remount Creek that exhibited flowing or standing water during the on-site habitat evaluation was the southernmost portion. The presence of small pools of water (1 to 2 feet in length) in this portion of Remount Creek is most likely due to groundwater discharge. The remaining portion of Remount Creek adjacent to Range 19 was completely dry. The creek is narrow (less than 3 feet across) and shallow (less than 6 inches deep) when water is present and has a variable substrate of mud and leaf litter interspersed with areas of sand and gravel. The presence of water in Remount Creek is highly dependent upon the volume of precipitation received by the Remount Creek watershed. During dry periods, the creek may be entirely dry for significant portions of the year (6 to 8 months). Under normal rainfall conditions, the creek most likely maintains flow for 6 to 8 months of the year. The ephemeral nature of Remount Creek in this area limits its ability to support many aquatic organisms (e.g., large fish) and other organisms that rely on aquatic species for food (e.g., piscivores).

The portion of Remount Creek that runs adjacent to Range 19 has been identified as a low quality foraging area for the federally listed endangered gray bat (*Myotis grisescens*) (Garland, 1996). Since Remount Creek is dry during significant portions of the year, aquatic insects (a major food item of gray bats) would not be present during those dry periods. Additionally, construction of the "Eastern Bypass" directly adjacent to the Remount Creek corridor has

eliminated a significant portion of the trees and shrubs that formerly provided a canopy over Remount Creek. Because the gray bat requires continuous cover while travelling to and from its foraging habitats and while foraging, the elimination of significant portions of the forest in this area would negatively affect its foraging habits. Based on its ephemeral nature in this area and the elimination of significant portions of the forest canopy, Remount Creek may no longer provide foraging habitat for the gray bat in the vicinity of Range 19.

2.3 Range 13 Habitat

The total area of Range 13, including the range fan, encompasses 549 acres. The main study area is limited to approximately 5 acres, which are described herein as the “cleared” areas. The “cleared” area of Range 13 is dominated by grasses and early successional species. In the past, this area consisted of maintained lawn, mowed field, unvegetated soil, and roadways. Since maintenance activities have ceased, the grasses have grown uncontrolled and early successional species have intruded. Various grasses and herbaceous species dominate this habitat type. Scrub pine saplings (*Pinus virginiana*) have also begun to encroach into these previously maintained areas. The forested areas surrounding the “cleared” area at Range 13 can be characterized as mixed deciduous/coniferous forest. Scrub pine and southern red oak dominate this habitat. There are minimal understory or herbaceous layers in this forest type, as fallen leaves and pine needles form a thick mat that precludes the germination of smaller plants. White-tailed deer, wild turkey, gray squirrel, and various song birds were observed on site. Details regarding site history, physical characteristics, and other background information are presented in the EE/CA (IT, 2001a). A general depiction of Range 13 is presented in Figure 3-3.

Remount Creek, along the 800-foot length that runs adjacent to the western boundary of Range 13, exhibits sections of very slow moving water (zero to 6 inches deep) and areas which are completely dry. The presence of small, intermittent areas of water (less than 1 foot to several feet in length) is most likely due to groundwater discharge to the creek. The creek is narrow (less than 3 feet across) and shallow (less than 6 inches deep) when water is present and has a variable substrate of mud and leaf litter interspersed with areas of sand and gravel. The presence of water in Remount Creek is highly dependent upon the volume of precipitation received by the Remount Creek watershed. During dry periods, the creek may be entirely dry for significant portions of the year (6 to 8 months). Under normal rainfall conditions, the creek most likely maintains flow for 6 to 8 months of the year. The ephemeral nature of Remount Creek in this area limits its ability to support many aquatic organisms (e.g., large fish) and other organisms that rely on aquatic species for food (e.g., piscivores).

The entire forest canopy and all the underlying brush in this area were removed prior to construction of the “Eastern Bypass.” The portion of Remount Creek that runs adjacent to Range 13 has been identified as low quality foraging habitat for the federally listed endangered gray bat (*Myotis grisescens*) (Garland, 1996). Because the gray bat requires continuous cover while travelling to and from its foraging habitats and while foraging, the elimination of significant portions of the forest in this area would negatively affect its foraging habits. Based on its ephemeral nature in this area and the complete elimination of the forest canopy, Remount Creek may no longer provide foraging habitat for the gray bat in the vicinity of Range 13.

2.4 Range 12 Habitat

The total area of Range 12, including the range fan, encompasses 311 acres. The main study area is limited to approximately 5 acres, which are described herein as the “cleared” areas. The “cleared” area of Range 12 is dominated by grasses and early successional species. In the past, this area consisted of maintained lawn, mowed field, and roadways. Since maintenance activities have ceased, the grasses have grown uncontrolled and early successional species have intruded. Various grasses and herbaceous species dominate this habitat type. Scrub pine saplings (*Pinus virginiana*) have also begun to encroach into these previously maintained areas. The forested areas surrounding the “cleared” area at Range 12 can be characterized as mixed deciduous/coniferous forest. Scrub pine and southern red oak dominate this habitat. There are minimal understory or herbaceous layers in this forest type, as fallen leaves and pine needles form a thick mat that precludes the germination of smaller plants. White-tailed deer, wild turkey, gray squirrel, and various song birds were observed on site. Details regarding site history, physical characteristics, and other background information are presented in the EE/CA (IT, 2001a). A general depiction of Range 12 is presented in Figure 3-2.

Along the 400 foot length that runs adjacent to the western boundary of Range 12, Remount Creek exhibits small sections (1 foot to several feet long) of standing and/or very slow-moving water (zero to 6 inches deep) and areas which are completely dry. The presence of small, intermittent areas of water is most likely due to groundwater discharge to the creek. The creek is narrow (less than 3 feet across) and shallow (less than 6 inches deep) when water is present and has a variable substrate of mud and leaf litter interspersed with areas of sand and gravel. The presence of water in Remount Creek is highly dependent upon the volume of precipitation received by the Remount Creek watershed. During dry periods, the creek may be entirely dry for significant portions of the year (6 to 8 months). Under normal rainfall conditions, the creek most likely maintains flow for 6 to 8 months of the year. The ephemeral nature of Remount Creek in this area limits its ability to support many aquatic organisms (e.g., large fish) and other organisms that rely on aquatic species for food (e.g., piscivores).

The forest canopy was completely removed in this area prior to construction of the “Eastern Bypass.” The portion of Remount Creek that runs adjacent to Range 12 has been identified as low quality foraging habitat for the federally listed endangered gray bat (*Myotis grisescens*) (Garland, 1996). Because the gray bat requires continuous cover while travelling to and from its foraging habitats and while foraging, the complete elimination of the forest canopy in this area would negatively effect its foraging habits in this area. Based on its ephemeral nature in this area and the elimination of the forest canopy, Remount Creek may no longer provide foraging habitat for the gray bat in the vicinity of Range 12.

2.5 Remount Creek Habitat

Remount Creek in the vicinity of the IMR ranges is a small, ephemeral stream that flows (when water is present) from south to north. The physical characteristics of Remount Creek and the surrounding land use vary along its length, from its headwaters at Yahou Lake to its confluence with Cane Creek near the west-northwest boundary of the Main Post. The headwaters of Remount Creek are formed by the discharge from Yahou Lake and its tributaries, approximately 0.75 miles south of Range 12. Remount Creek runs in a northerly direction along the topographic low formed by gently sloping hills to the east and west of the creek. The vast majority of the length of Remount Creek between Yahou Lake and the IMR ranges runs through the “Eastern Bypass” corridor. All of the trees in the bypass corridor have been clear-cut and all of the vegetation removed. The entire area has been covered with mulch that was created by “chipping” the vegetation that was cut down. The land surrounding Remount Creek adjacent to Ranges 12 and 13 is characteristic of the clear-cut areas associated with the “Eastern Bypass” corridor. There is a narrow forested corridor surrounding Remount Creek in the areas adjacent to Range 19 and the Skeet Range.

Immediately north of the Skeet Range, Remount Creek flows through a culvert under the old parade grounds/athletic fields and then through the grounds of the Cane Creek Golf Course until its confluence with Cane Creek in the west-northwestern corner of the Main Post.

In general, Remount Creek is narrow (2 to 3 feet wide) and shallow (less than 4 inches deep), with a low gradient along its length from its origin at Yahou Lake to the IMR ranges. The substrate of Remount Creek in the vicinity of the IMR ranges varies from leaf litter and mud to gravel and cobbles. The southern portion of Remount Creek exhibits a variable substrate of gravel and cobbles interspersed with small pockets of leaf litter and mud. This substrate is prevalent adjacent to Ranges 12, 13, and 19. The substrate adjacent to the Skeet Range becomes mostly gravel and cobbles towards the northern portion of the range.

Water in Remount Creek originates mainly from discharge from Yahou Lake and overland flow from the surrounding watershed. There also appear to be localized contributions to creek flow from groundwater where the potentiometric surface exceeds the creek bed surface. This is evidenced by the fact that small pools of water (less than 1 foot to several feet long) exist even during periods when the vast majority of the creek is dry. The flow contribution from groundwater varies according to the amount of precipitation, with an increase when precipitation raises the potentiometric surface.

3.0 Constituents Detected On Site

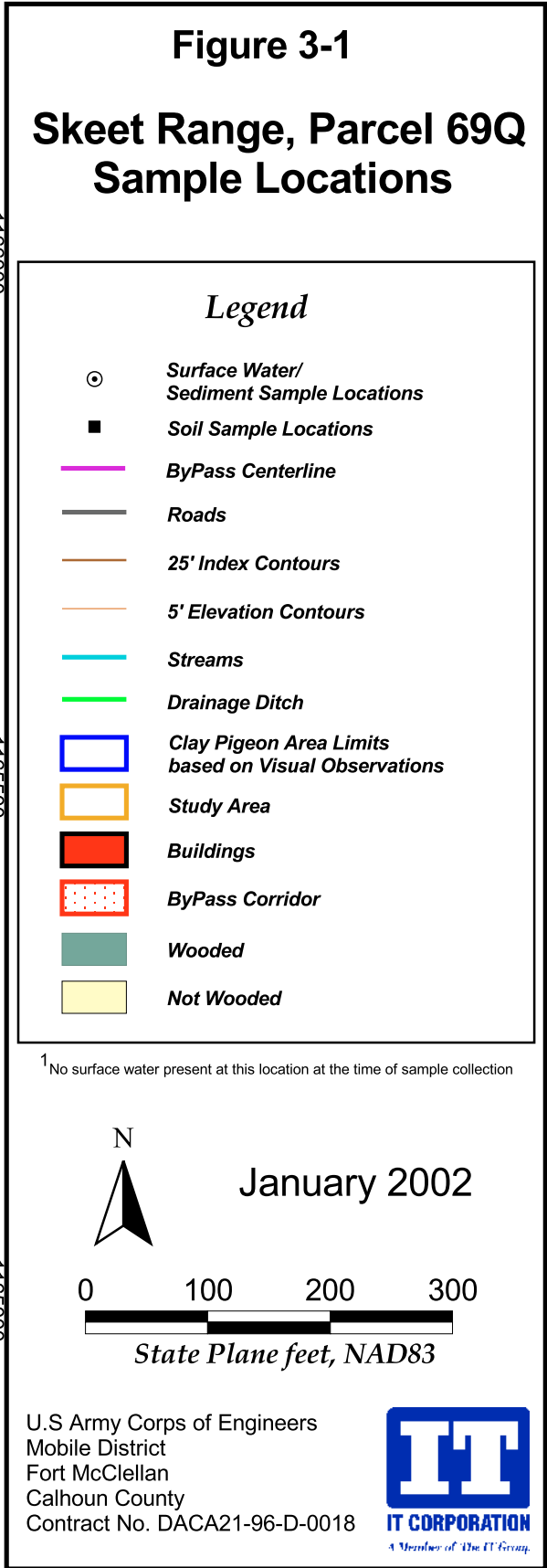
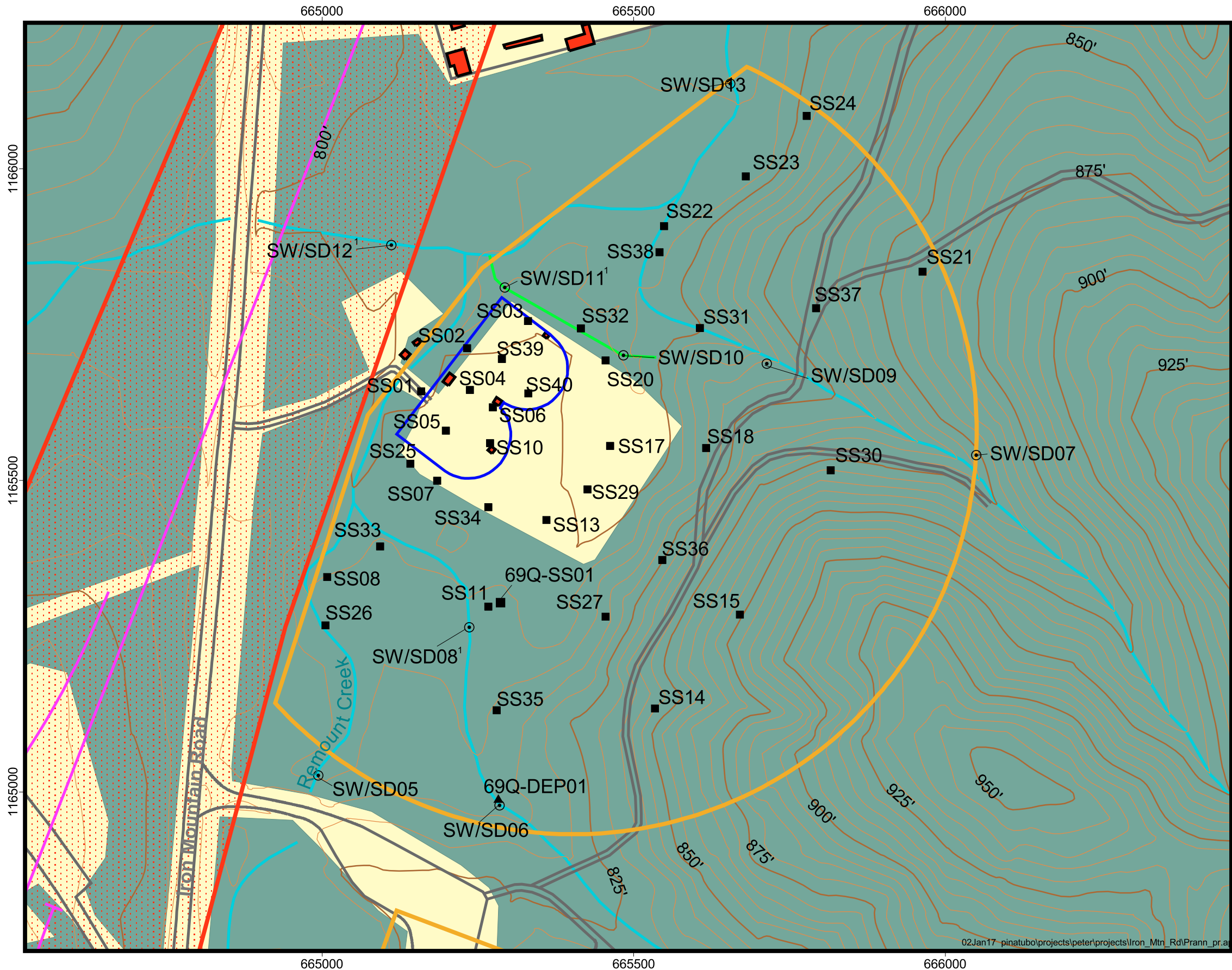
Constituents detected in soil, sediment, and surface water at the IMR ranges are summarized in Tables F-5 through F-8 of the EE/CA (IT, 2001a). A Draft SLERA was conducted using these data, and data gaps were identified (IT, 2001b). Based on the identified data gaps, additional sampling and analyses were conducted within the original study areas and the range safety fans. The results of the additional sampling were incorporated into the original database to form a comprehensive database for the IMR ranges. Summaries of the constituents detected in surface soil, surface water, and sediment from this comprehensive database are presented in Appendix A of the EE/CA (IT, 2001b). The locations of surface soil samples collected at the IMR ranges are presented in Figures 3-1 through 3-4. The locations of the surface water and sediment samples collected at the IMR ranges are presented in Figure 3-5.

The sampling and analysis programs conducted at the small arms ranges at FTMC were designed based on a number of factors, including:

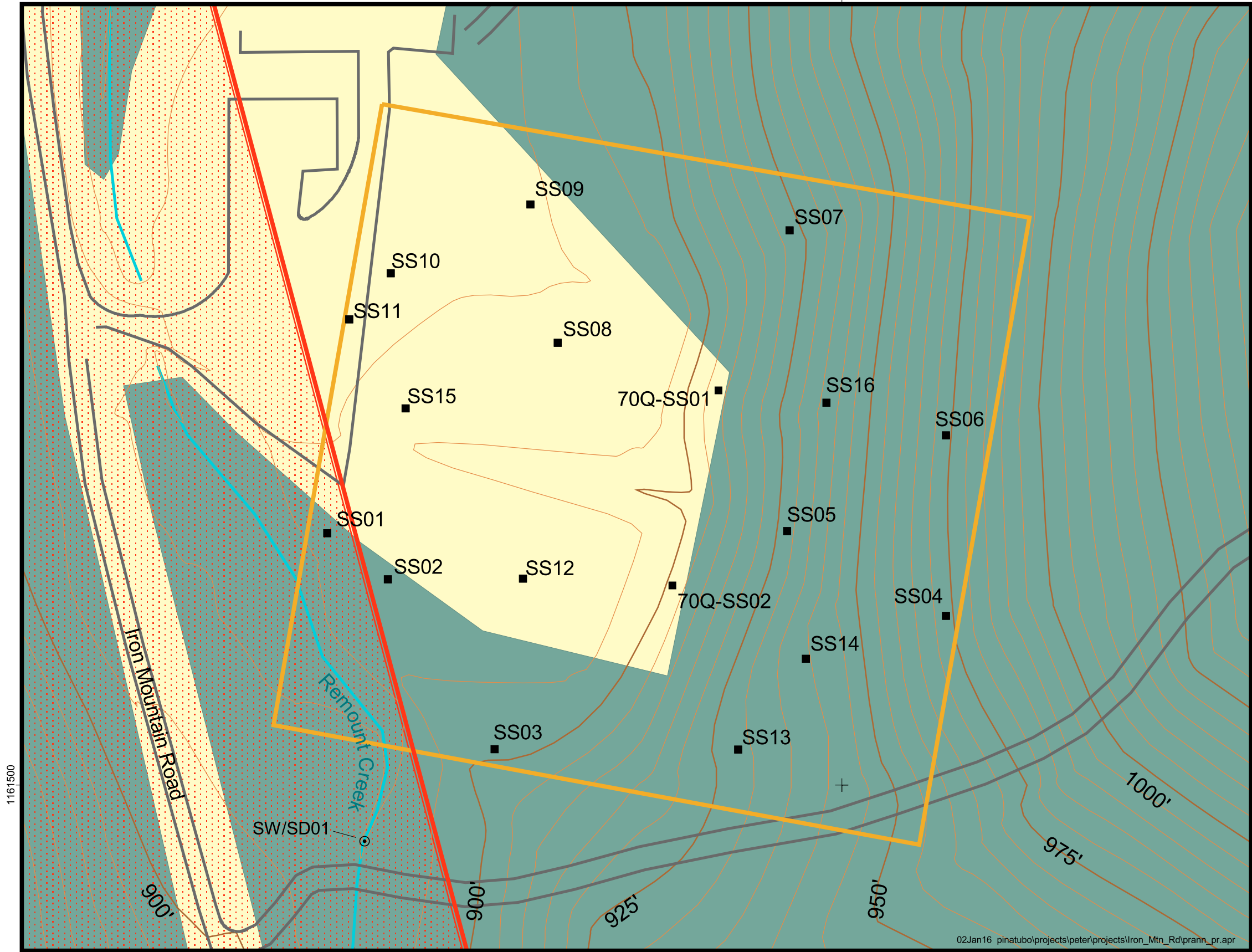
- Known and documented historical operating practices at the ranges (i.e., known dates of construction and operation, knowledge of armaments used, knowledge that no other activities took place at these ranges)
- Physical configuration of the ranges.

The fact that the Army has detailed knowledge of the historical operating practices at these ranges increases the confidence that all of the COPECs have been identified at these small arms ranges. Additionally, the physical configuration of some of the ranges reduces the probability of contamination in certain areas (e.g., range fans that extend beyond a large physical obstacle, such as a mountain, are not likely to exhibit site-related contamination).

The sampling and analytical protocols used in the original SLERA were part of the EE/CA for the IMR ranges. These protocols were designed to facilitate the estimation of contaminated soil volumes and were not specifically designed to characterize the nature and extent of contamination. However, additional sampling and analyses were conducted at the IMR ranges to increase the probability that all contaminants at the site have been detected and that the maximum concentration of each contaminant has been determined. The additional sampling and analyses that were conducted at the IMR ranges included the collection of seven surface soil samples, ten groundwater samples, one surface water sample, and one sediment sample from locations that were identified as areas of greatest potential constituent concentration through



665000



665000

Figure 3-2

Range 12, Parcel 70Q
Sample Locations

Legend

- ⊙ Surface Water/
Sediment Sample Locations
- Soil Sample Locations
- Roads
- 25' Index Contours
- 5' Elevation Contours
- Streams
- Study Area
- ByPass Corridor
- Wooded
- Not Wooded



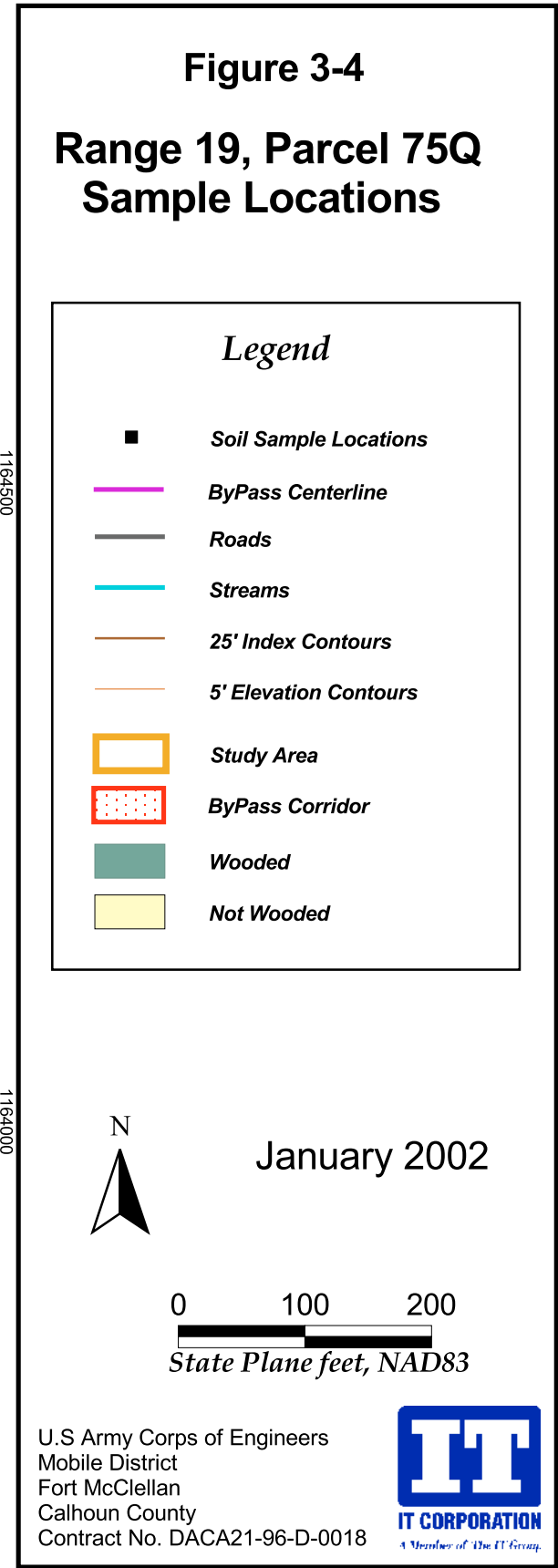
January 2002

0 50 100
State Plane feet, NAD83

U.S Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County
Contract No. DACA21-96-D-0018



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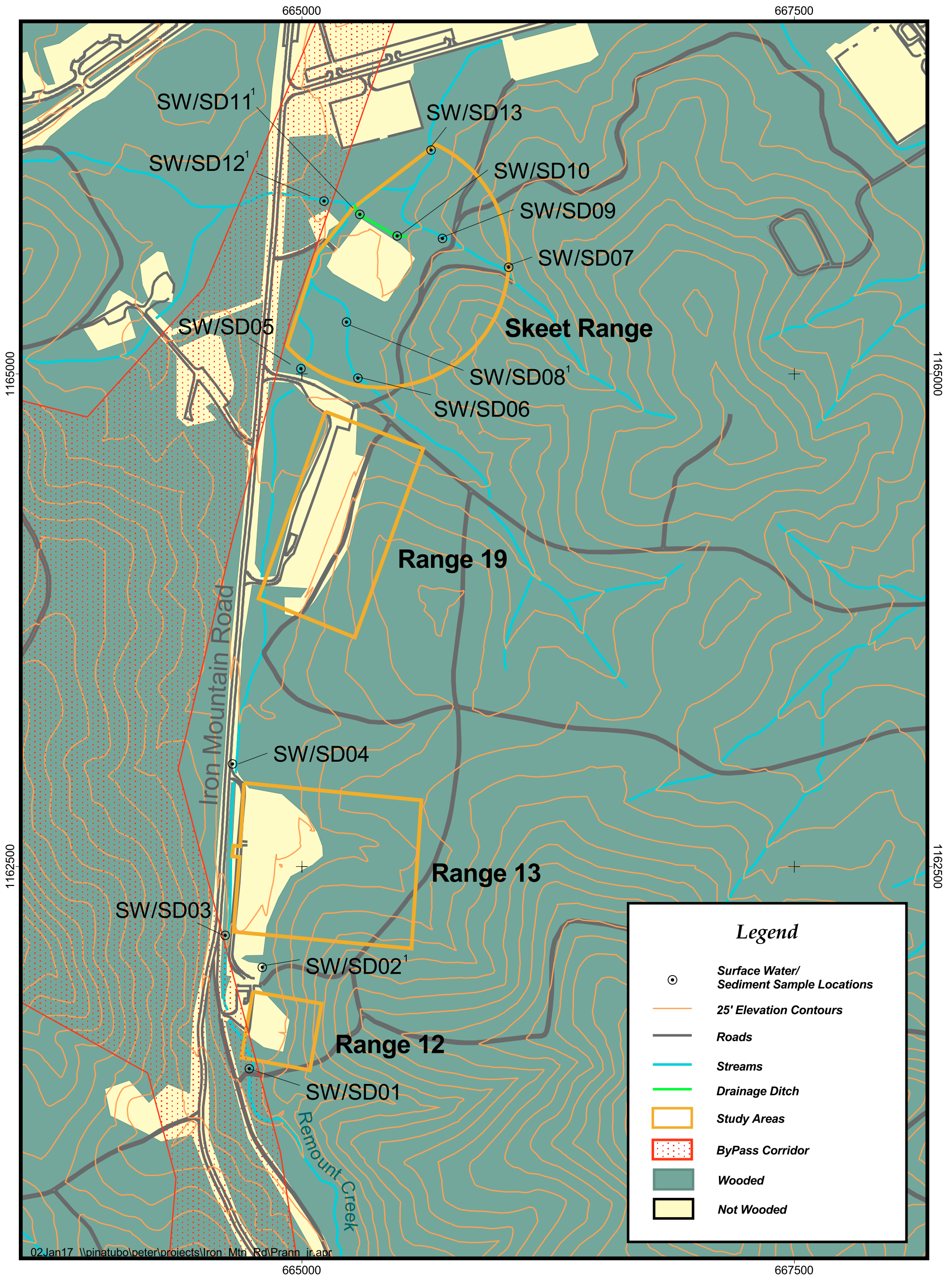


Figure 3-5 Remount Creek - Surface Water/Sediment Sample Locations

January 2002

0 500 1000
State Plane feet, NAD83

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County
Contract No. DACA21-96-D-0018



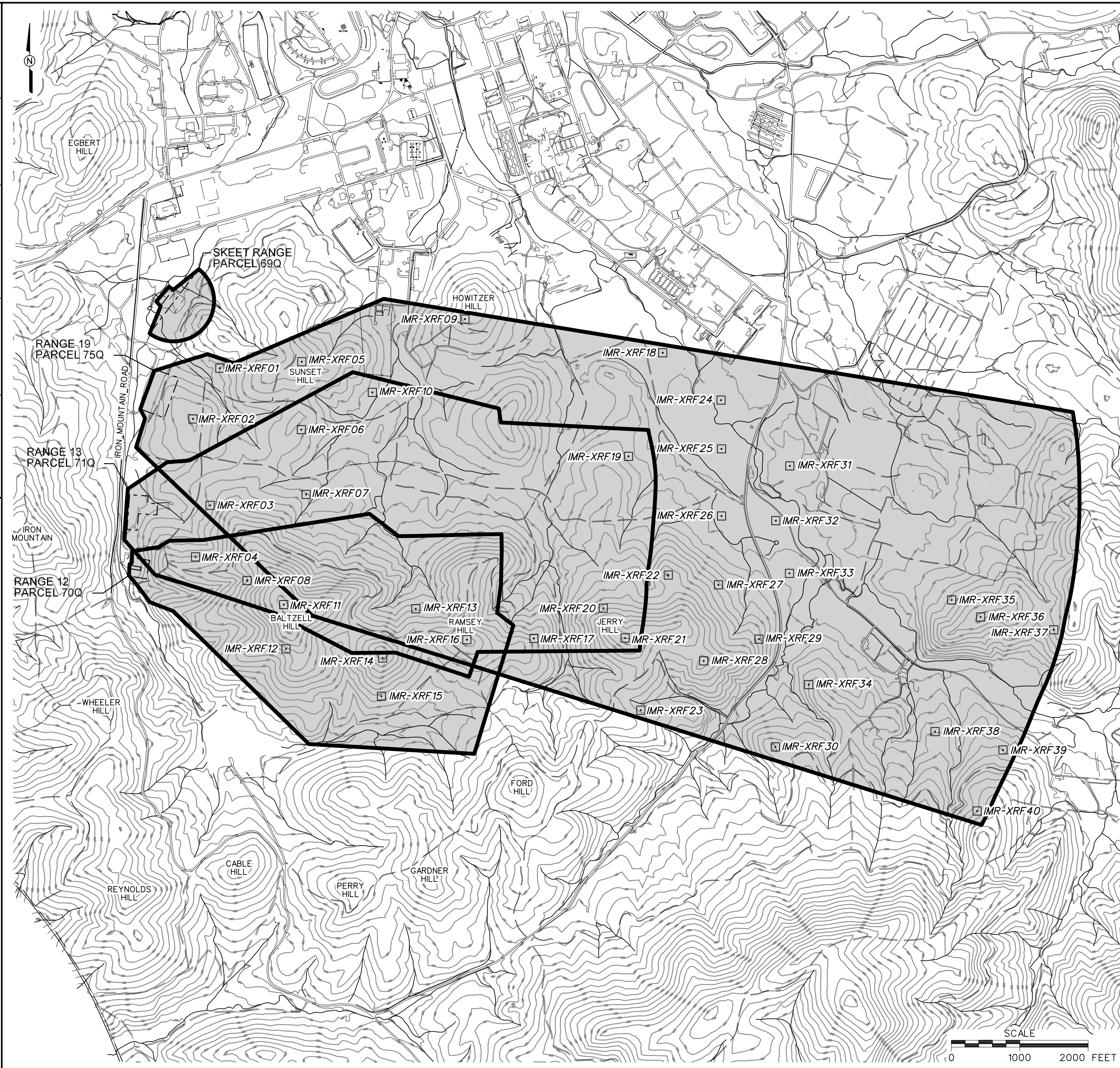
¹ No surface water present at this location at the time of sample collection

previous sample analysis, site history (i.e., impact zones), and visual evidence. For instance, three surface soil samples were collected from the soil berm at Range 19 that acted as the impact zone for the small arms training that took place at this range. Visual evidence of bullets and bullet fragments also indicated that samples from this area would represent “worst case” constituent concentrations. These additional samples were analyzed for a complete set of parameters in order to determine the maximum lead concentrations at these sites and to determine the presence of any additional constituents that may have the potential to pose ecological risk at these sites. This additional sampling also included the analysis of soils in the range safety fans by x-ray fluorescence (XRF) technology to determine the potential for contamination in these remote areas. XRF sampling was conducted within the range safety fans in order to determine whether lead contamination resulting from small arms training activities had impacted these areas.

Samples for XRF analysis were collected from 40 gridded locations within the range safety fans of the IMR ranges. The locations of the XRF samples are presented in Figure 3-6. These 40 samples were analyzed in situ using an energy-dispersive portable XRF instrument. Although the XRF instrument will measure a number of metals present in a sample, lead was selected as an indicator of contamination from range-related activities. The results of the XRF analyses indicated that lead concentrations in soil within the safety fans are generally within the range of lead found in naturally-occurring soils at FTMC. The results of the XRF analyses are presented in Table 3-1. A statistical summary of the results of the XRF analyses and a comparison to “background” lead concentrations at FTMC are presented in Table 3-2.

In general, inorganic constituents were commonly detected in soils, but organic compounds (i.e., volatiles, semivolatiles, pesticides/herbicides) were infrequently detected and at low concentrations. Antimony, copper, lead, and zinc were the most commonly detected inorganic compounds, and were detected at elevated concentrations (with respect to ecological screening values) in surface soil at all four of the ranges at Iron Mountain Road. Arsenic was detected at elevated concentrations in surface soil (with respect to ecological screening values) at all of the IMR ranges except the Skeet Range.

In addition to the elevated concentrations of antimony, copper, lead, and zinc in surface soil at the Skeet Range, several other inorganic compounds were detected at elevated concentrations, including beryllium, cobalt, and manganese. There is no readily apparent pattern to the concentrations of the inorganic compounds detected in surface soil at the Skeet Range. Four polynuclear aromatic hydrocarbon (PAH) compounds were also detected at elevated concentrations in surface soil at the Skeet Range. These PAH compounds were infrequently



- LEGEND:**
- UNIMPROVED ROADS AND PARKING
 - PAVED ROADS AND PARKING
 - BUILDING
 - TOPOGRAPHIC ONTOURS (CONTOUR INTERVAL - 25 FOOT)
 - PARCEL BOUNDARY
 - STUDY AREA
 - SURFACE DRAINAGE / CREEK
 - XRF SURFACE SOIL SAMPLE LOCATION

FIGURE 3-6
XRF SAMPLE LOCATION MAP
IRON MOUNTAIN ROAD
RANGE FANS

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT McLELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018

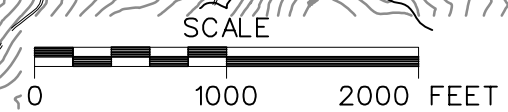


Table 3-1

**Summary of XRF Investigation Data for the Iron Mountain Road Range Safety Fans
Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

| Sample Location | XRF Result (mg/kg) | | | Other Metals ¹ (mg/kg) | | |
|------------------|--------------------|-----|------|-----------------------------------|------|-----|
| | Lead | STD | Qual | Zn | Cu | Cr |
| IMR-XRF01 | 36 | 13 | U | | | |
| IMR-XRF02 | 67.1 | 18 | J | 98.2 | | |
| IMR-XRF03 | 47.6 | 17 | U | 43.2 | | |
| IMR-XRF04 | 35.8 | 11 | J | 46.5 | | |
| IMR-XRF05 | 53.7 | 14 | J | 49.1 | | |
| IMR-XRF06 | 18 | 7.7 | U | | | |
| IMR-XRF07 | 45.4 | 14 | J | 36.9 | | |
| IMR-XRF08 | 42.9 | 15 | U | 219 | | |
| IMR-XRF09 | 33.1 | 12 | U | | | |
| IMR-XRF10 | 37.6 | 14 | U | 44.5 | | |
| IMR-XRF11 | 27.2 | 12 | U | 168 | | |
| IMR-XRF12 | 47.3 | 17 | U | | | |
| IMR-XRF13 | 42.1 | 12 | J | | | |
| IMR-XRF14 | 61.9 | 14 | J | 107 | | |
| IMR-XRF15 | 41.4 | 14 | U | | | |
| IMR-XRF16 | 46.5 | 14 | J | 38 | | |
| IMR-XRF17 | 39 | 12 | J | 41.4 | | |
| IMR-XRF18 | 41.9 | 19 | U | | | |
| IMR-XRF19 | 108 | 12 | J | 44.7 | 45.1 | |
| IMR-XRF20 | 29.8 | 9.6 | J | 44.1 | | |
| IMR-XRF21 | 48.7 | 14 | J | 59.7 | | 193 |
| IMR-XRF22 | 32.2 | 11 | U | 159 | | |
| IMR-XRF23 | 26.4 | 13 | U | 34.4 | | |
| IMR-XRF24 | 42.5 | 17 | U | | | |
| IMR-XRF25 | 40.7 | 14 | U | | | |
| IMR-XRF26 | 32.6 | 13 | U | 51 | | |
| IMR-XRF27 | 35.5 | 9.6 | J | | | |
| IMR-XRF28 | 43.3 | 12 | J | 32.9 | | |
| IMR-XRF29 | 60.2 | 13 | J | 28.2 | | |
| IMR-XRF30 | 36.9 | 12 | J | 62.6 | | |
| IMR-XRF31 | 28.6 | 14 | U | 35.5 | | |
| IMR-XRF32 | 43.4 | 13 | J | 34 | | |
| IMR-XRF33 | 46.6 | 15 | J | 89.8 | | |
| IMR-XRF34 | 59.2 | 15 | J | 52.1 | | |

Table 3-1

Summary of XRF Investigation Data for the Iron Mountain Road Range Safety Fans
Fort McClellan, Calhoun County, Alabama

(Page 2 of 2)

| Sample Location | XRF Result (mg/kg) | | | Other Metals ¹ (mg/kg) | | |
|-----------------|--------------------|-----|------|-----------------------------------|----|----|
| | Lead | STD | Qual | Zn | Cu | Cr |
| IMR-XRF35 | 58.5 | 16 | J | 42.3 | | |
| IMR-XRF36 | 37.5 | 21 | U | 46.5 | | |
| IMR-XRF37 | 30.6 | 15 | U | 39.2 | | |
| IMR-XRF38 | 54.4 | 14 | J | 50.3 | | |
| IMR-XRF39 | 57.5 | 14 | J | 43.7 | | |
| IMR-XRF40 | 30 | 12 | U | 173 | | |

¹Other metals were reported only when quantified by the XRF. Empty cell represents no XRF detection for that sample.

Boldface type indicates a sample aliquot was prepared by air drying, crushing, and sieving. The prepared aliquot was analyzed using XRF before shipment to fixed-base laboratory for confirmation analysis. The XRF results shown represent the prepared aliquot.

XRF - x-ray fluorescence.

mg/kg - milligram per kilogram.

IMR - Iron Mountain Road ranges - Range 19, Range 12, and Range 13.

STD - standard deviation.

Qual - data qualifier.

U - Lead result was less than 3x the STD of the measurement and is considered not detected.

J - Lead result was less than 10x the STD of the measurement and is considered estimated.

Table 3-2

**Statistical Summary of Lead Data From Safety Fans and Background Data
Fort McClellan, Calhoun County, Alabama**

| Constituent | Background Threshold Value ^a (mg/kg) | Range of Site-Wide Background (mg/kg) | 95% UCL Site-Wide Background (mg/kg) | 95% UTL Site-Wide Background (mg/kg) | Ecological Screening Value ^b (mg/kg) | Maximum Detected IMR Safety Fan Conc. (mg/kg) | Minimum Detected IMR Safety Fan Conc. (mg/kg) | Mean Detected IMR Safety Fan Conc. (mg/kg) |
|--------------------|--|--|---|---|--|--|--|---|
| Lead | 40.1 | 2.89 - 82.8 | 50.7 | 63.8 | 50 | 108 | 18 | 43.69 |

Notes:

^a Background threshold value is 2-times the arithmetic mean background concentration as reported in
"Final Background Metals Survey Report, Ft. McClellan, Alabama" (SAIC, 1998).

^b

detected (one or two detections out of sixteen samples) and the detected concentrations were relatively low. The detected PAHs were only found in two sample locations within the clay pigeon shooting area at the Skeet Range. The Skeet Range was the only range at IMR where PAHs were detected at elevated concentrations.

As with the other ranges at IMR, surface soil at Range 12 exhibited elevated (with respect to ecological screening values) concentrations of antimony, arsenic, copper, lead, and zinc. The highest concentrations of antimony, copper, lead, and zinc were found in samples collected from the soil berm which acted as the impact zone for the small arms that were used at this range. The only other compound that was detected in surface soil at elevated concentrations was 4,4'-dichlorodiphenyltrichloroethane (DDT). This compound was detected in one out of two samples and the detected concentration was only slightly elevated (with respect to its ecological screening value). The sample that exhibited a detectable concentration of 4,4'-DDT was located at the base of the soil berm at Range 12, and is most likely indicative of vegetation control practices at the range.

Range 13 exhibited elevated concentrations of antimony, arsenic, copper, lead, and zinc in surface soil. The highest concentrations of antimony, copper, lead, and zinc were found in samples collected from the soil berm which acted as the impact zone for the small arms that were used at this range. Detectable concentrations of arsenic did not exhibit a correlation with the small arms training activities conducted at Range 13.

Range 19 exhibited elevated concentrations of antimony, arsenic, copper, lead, silver, and zinc in surface soil. Silver was only detected in one surface soil sample out of eight collected at Range 19. The sample that exhibited a detectable concentration of silver was located at the base of the soil berm at Range 19. The highest concentrations of antimony, copper, lead, and zinc were found in samples collected from the soil berm which acted as the impact zone for the small arms that were used at this range. Detectable concentrations of arsenic did not exhibit a correlation with the small arms training activities conducted at Range 19.

The only constituent in surface water that was detected at elevated concentrations (with respect to ecological screening values) was lead. At the time of sampling, much of Remount Creek and its tributaries in the vicinity of the IMR ranges did not contain water. Therefore, only nine of the fourteen planned surface water collection points were sampled. Four of the nine sample locations had detectable levels of lead, and only two sample locations exhibited elevated lead concentrations. These two samples were collected from a drainage ditch and a small tributary to

Remount Creek at the Skeet Range. None of the other IMR ranges exhibited elevated levels of any constituents in surface water.

A number of inorganic constituents were detected in sediment samples from Remount Creek and its tributaries at elevated concentrations. The highest concentrations of barium, beryllium, iron, manganese, thallium, and vanadium (all of which do not have ecological screening values associated with them) were all detected in sediment samples from the Skeet Range. All of the detected concentrations that exceeded the ecological screening values for arsenic, copper, lead, and nickel were found at the Skeet Range. Therefore, sediment samples from the Skeet Range are the only sediment samples at the IMR ranges that exhibit elevated concentrations of constituents (with respect to ecological screening values).

Several constituents were detected in groundwater at concentrations that exceeded the ecological screening values for surface water. The inorganic compounds barium, beryllium, cobalt, and manganese were detected at concentrations that exceeded their surface water ecological screening values. 2-Nitrotoluene, 4-amino-2,6-dinitrotoluene, 1,2,4-trimethylbenzene, and 1,2-dimethylbenzene were detected in groundwater samples at the IMR ranges, but there are no surface water ecological screening values associated with these compounds.